



Software for Architecture,
Engineering and Construction



AcouBAT by **CYPE**

User manual

Analysis and verification of sound insulation and absorption using the ACOUBAT analysis engine, designed by the CSTB (Scientific and Technical Centre for Buildings), and its database. This application is integrated in the Open BIM workflow via the BIMserver.center platform.





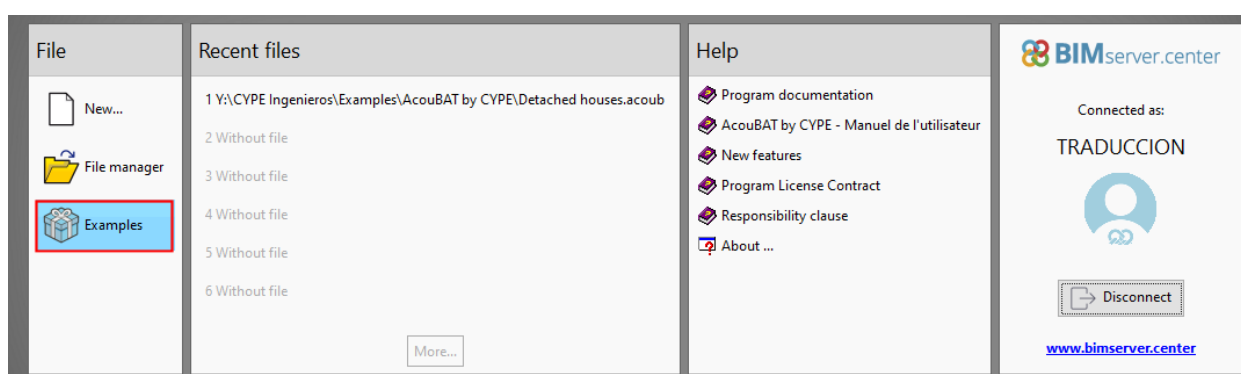
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1 Getting started

1.1 Opening the program

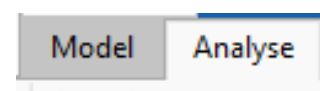
When opening the *AcouBAT by CYPE* program, you will have the possibility to create a new job or to open an existing project. To read this manual, we recommend that you to click on **Example** to open an example job.



Opening the program

1.2 General organisation

The program has two main tabs. The *Model* tab allows users to enter the job and the project parameters. The *Analyse* tab allows users to carry out the analyses, view the results and also gives access to the reports.



Main tabs



File. This button allows users to create a new job or to access the file management. This menu also contains save options and access to recently opened files. The management of the electronic license is also available via this button.

The top toolbar of the program contains the following icons:



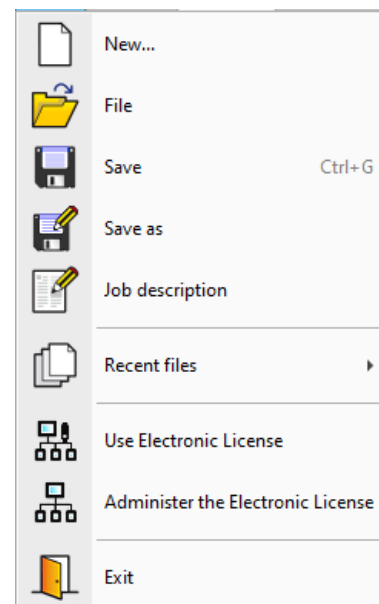
Save.



Undo.



Redo.



General toolbar:



Configuration. This button allows some of the program's default settings to be modified, such as the units of measurement, document text styles or the background colour of the program.

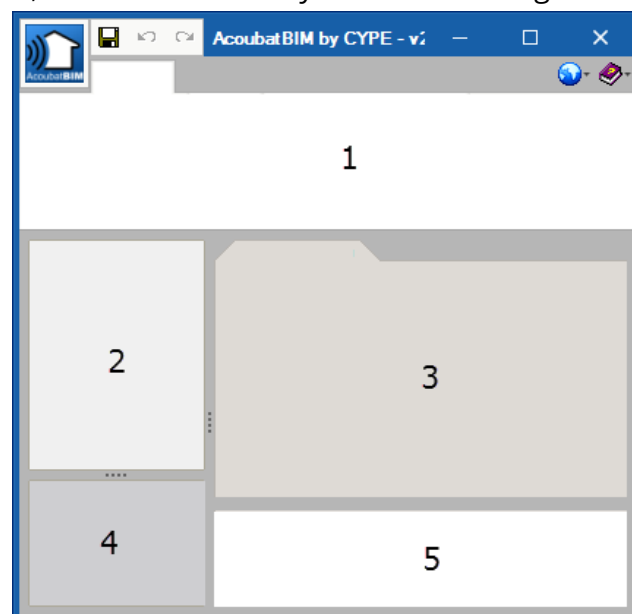


Help.

Each tab is organised as follows:

- 1 Menus and general functions
- 2 Element tree structure
- 3 Data and editing of elements
- 4 Viewing the BIM model
- 5 Warnings and errors

The context sensitive help can be accessed in any menu of the program by pressing **F1** or by clicking on the blue question mark icons.



General organisation

The input help menus can be accessed via the blue horizontal arrows to the right of the element input fields.

2 Input and analyses

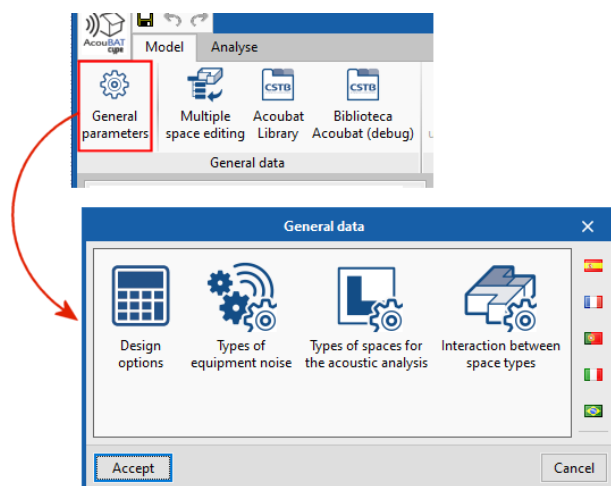
2.1 General data

2.1.1 *General parameters*

The job entry begins by inputting the *General data* in the *Model* tab.

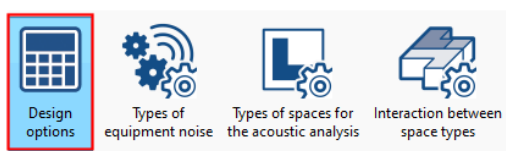
In this window users can access the parameters allowing the analysis options, types of spaces used in the project as well as the acoustic interactions between these space types to be filled in.

A configuration can be imported and saved using the buttons located to the right.

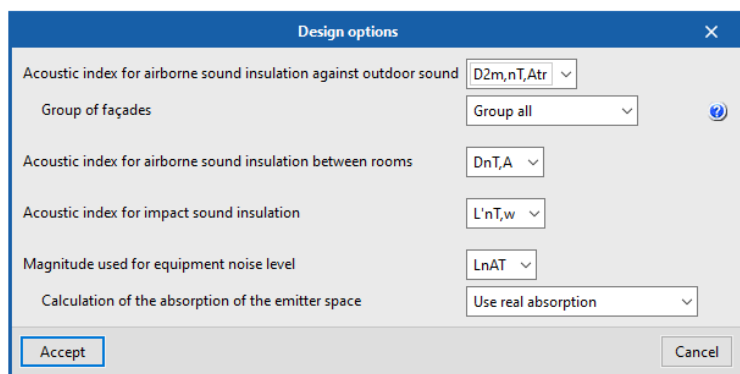


General parameters

2.1.2 *Design options*



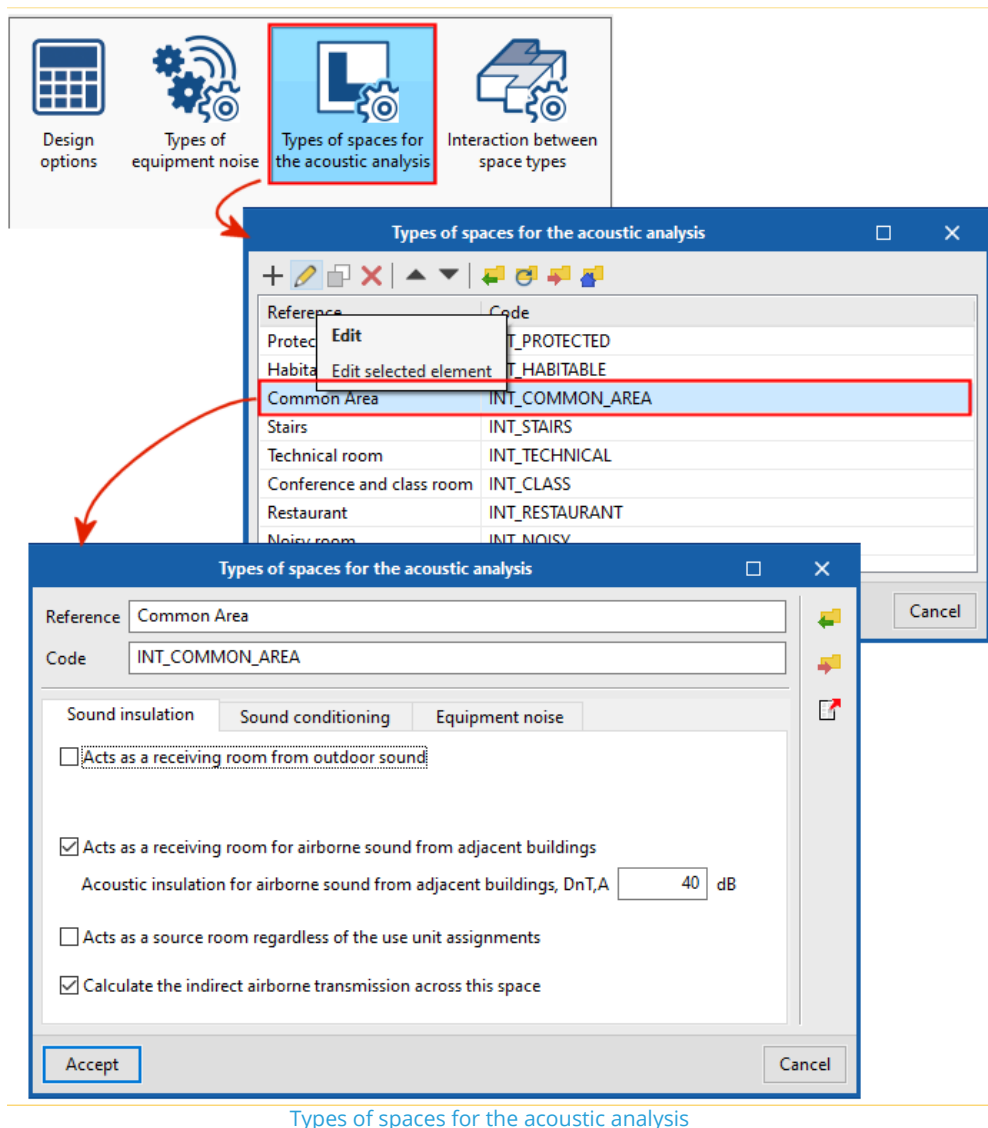
In the *Design options* window the values used in the project must be entered, as well as the group of façades used in the analyses.



Design options

In the *Types of spaces for the acoustic analysis* window, users must enter the spaces present in the project.

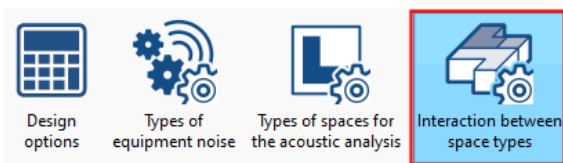
The buttons located in the top bar allows the type of spaces to be entered, modified, deleted or exported.



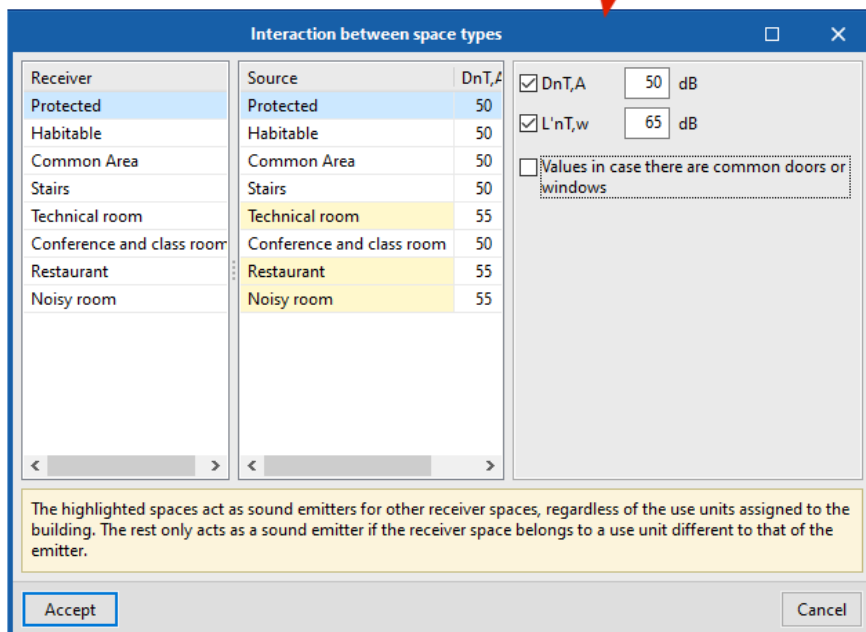
Types of spaces for the acoustic analysis

By double clicking on a space its acoustic characteristics for analysis can be accessed. The requirements must be entered for each type of space.

The *Acts as a source space regardless of the use unit assignments* box allows a space to be considered as an emitter regardless of the use unit in which it is present.



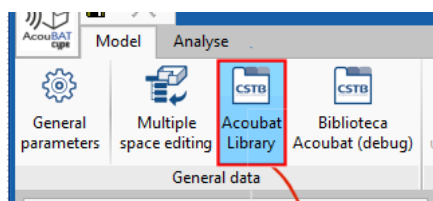
In the *Interactions between space types* window users must enter the insulation values for the insulation against airborne noise and impact sound insulation between the receiver and emitter spaces in the project.



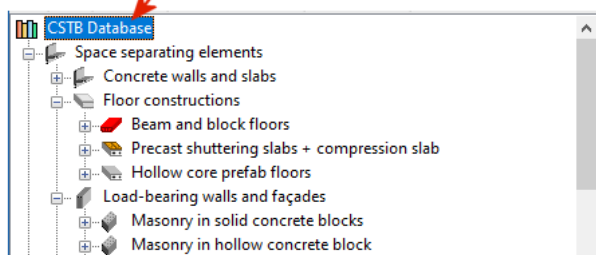
The highlighted spaces act as sound emitters for other receiver spaces, regardless of the use units assigned to the building. The rest only acts as a sound emitter if the receiver space belongs to a use unit different to that of the emitter.

Interaction between types of spaces

2.1.3 Acoubat Library



In the *Acoubat Library* window users can find the Acoubat database managed by the Scientific and Technical Centre for Building in France, the CSTB. Each product is classified according to different categories depending on its use in the building.



A product search engine and a comparison tool are available to facilitate the final decision.

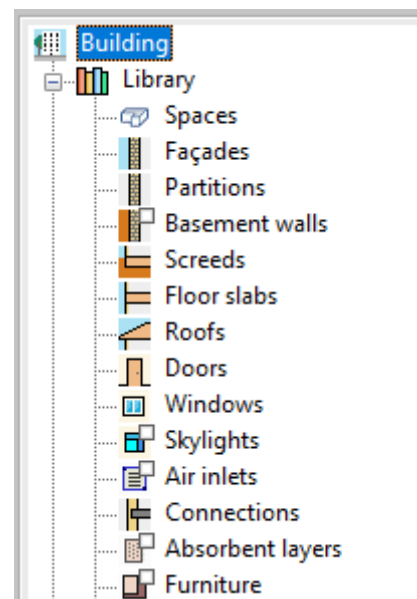
In addition to the products from Acoubat, it is possible to add new elements by manually entering their acoustic characteristics.

2.2 Library

2.2.1 Organisation

The library contains the reference for each element of a project. The features of the spaces, the walls, roofs, floors, openings, air inlets, connections, absorbent layers and furniture of the building must be entered here.

All library elements can be exported and then imported into a new analysis.

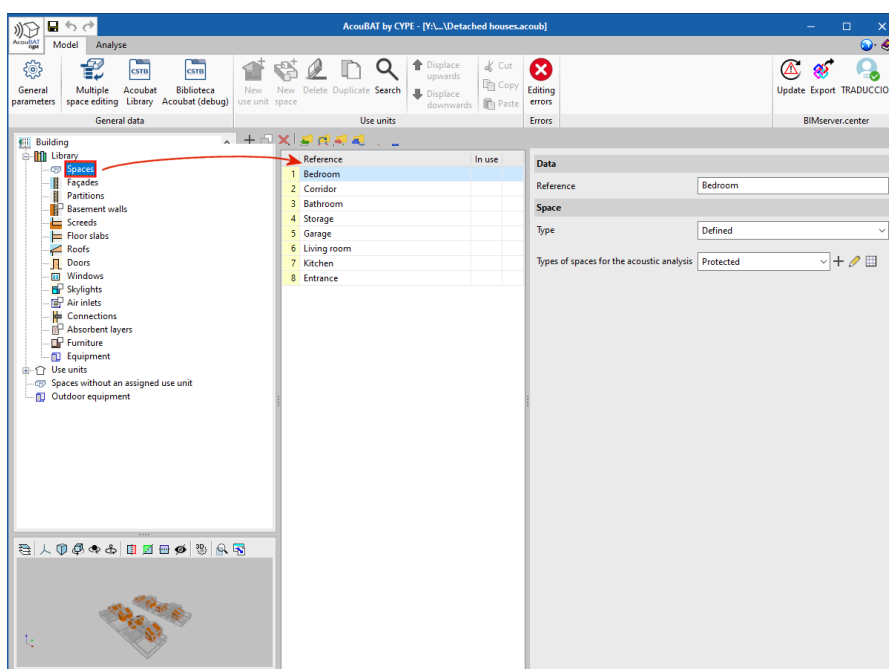


Library

2.2.2 Spaces

The spaces appear first in the library tree structure.

In this menu, users can choose for each space whether they are 'Defined or Excluded' in the acoustic analysis, as well as its type as specified in the general data.



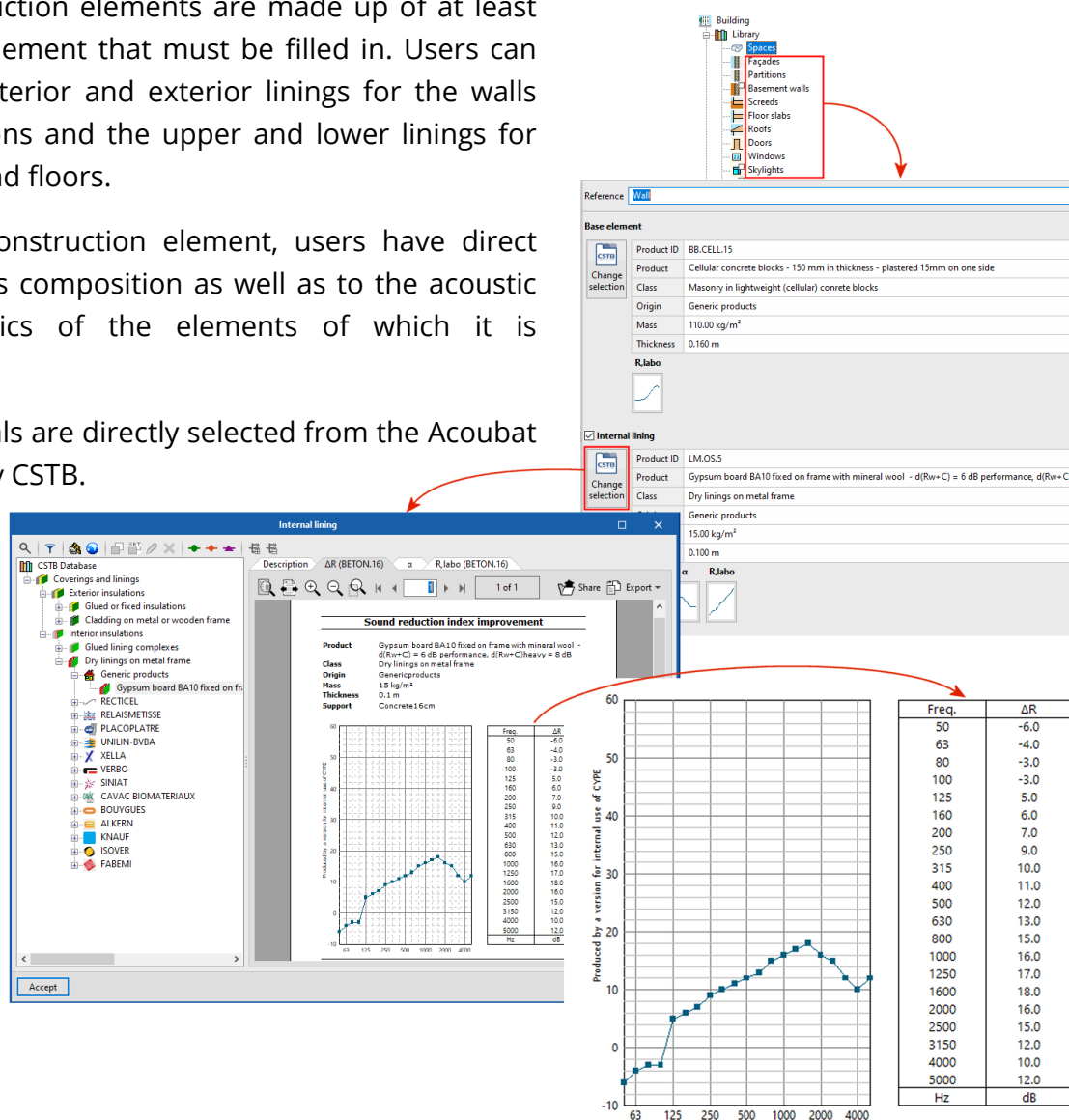
Spaces

2.2.3 Construction elements

The construction elements are made up of at least one base element that must be filled in. Users can also add interior and exterior linings for the walls and partitions and the upper and lower linings for the roofs and floors.

For each construction element, users have direct access to its composition as well as to the acoustic characteristics of the elements of which it is composed.

The materials are directly selected from the Acoubat database by CSTB.

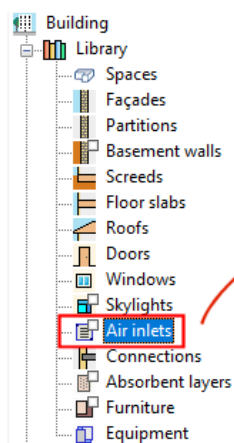


Construction elements

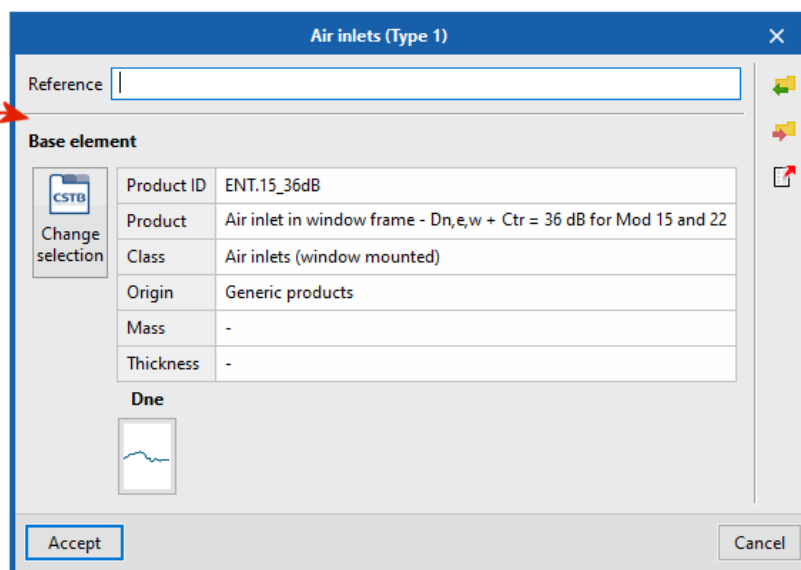
In the database included in AcouBAT by CYPE, users have access to the program's product files with all the necessary acoustic characteristics by type or by manufacturer. Advanced search and comparison tools are available in order to choose the product that best matches user needs.

2.2.4 Air inlets

By clicking on the *Air inlets* menu in the tree structure, air inlets can be created and introduced into the project.



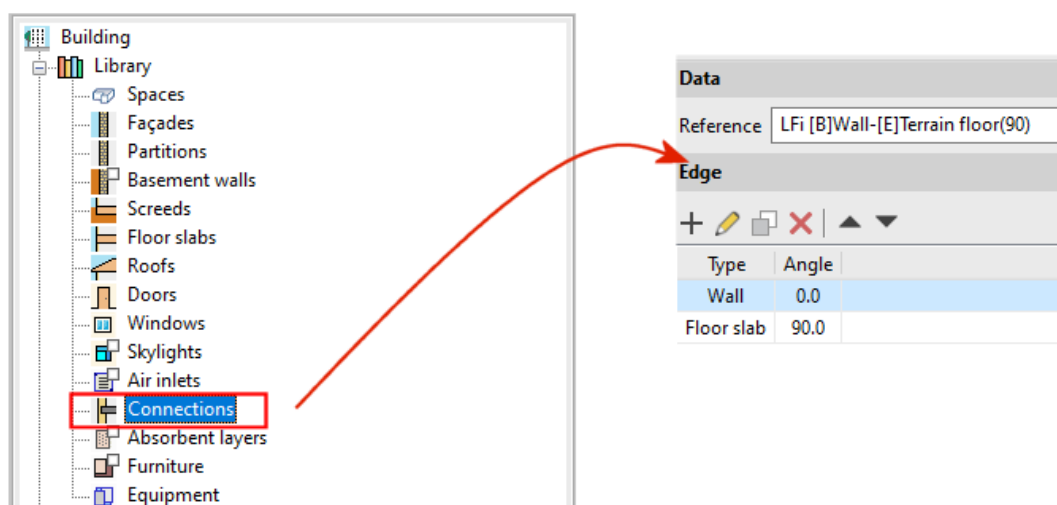
As for the other elements, a product catalogue is available in the program with the view of the acoustic characteristics.



Air inlets

2.2.5 Connections

In the *Connections* menu, all the connections between the construction elements present in the model can be found.

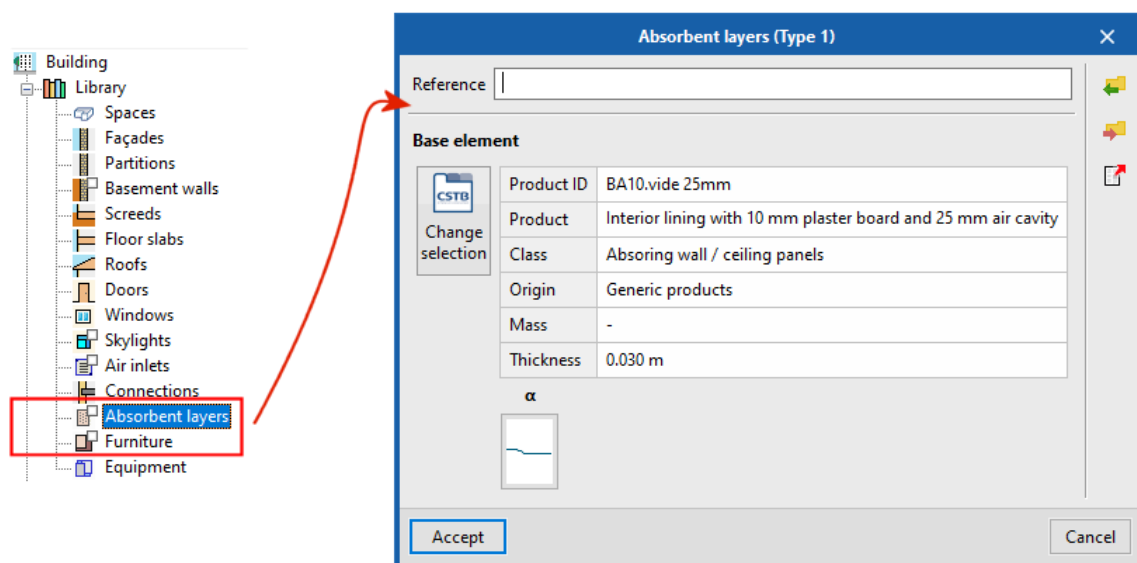


Connections

2.2.6 Absorbent layers and furniture

The *Absorbent layers* and *Furniture* menus allow users to add the elements present in the project and then introduce them into the spaces.

As for the other elements, a product catalogue is available in the program with the view of the acoustic characteristics.

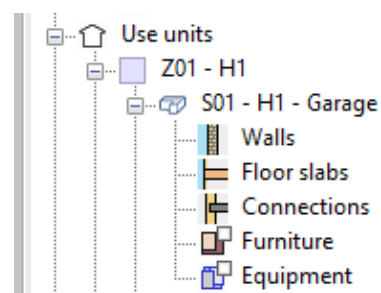
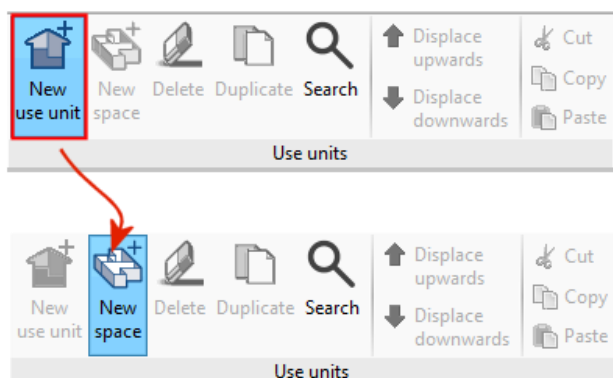


Absorbant layers and Furniture

2.3 Use units

2.3.1 Organisation

The *Use units* menu contains the use units and spaces of the project whose type, construction elements, air inlets, absorbent layers and furniture have been previously defined in the library.



Organisation of the use units

In AcouBAT by CYPE, users can arrange the spaces into use units based on the checks they wish to carry out.

In the *Spaces without a defined use unit* section, users can put the spaces that they do not wish to classify.

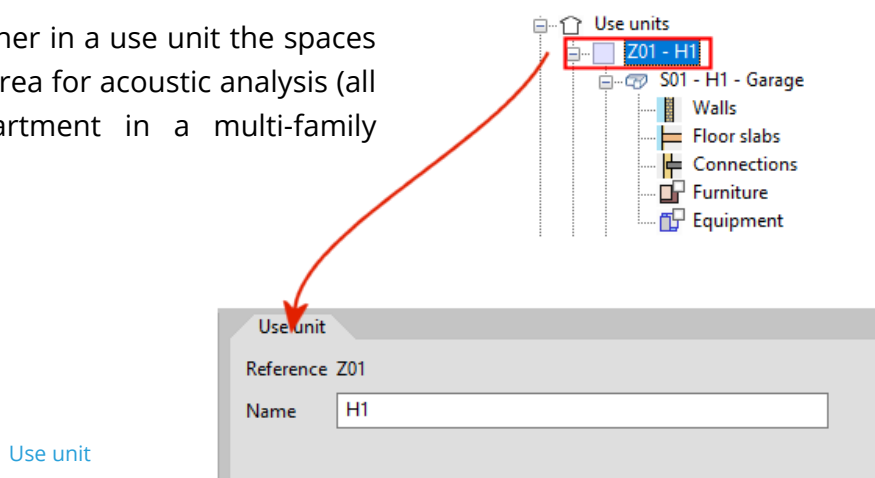
Users can create new use units by clicking on the **New use unit** button.

When a use unit is created, a new space can be associated with it using the **New space** button.

Users can also use the edit buttons in the use units menu to **Delete**, **Duplicate**, **Displace** and **Copy/Paste** the use units and spaces in their building. To access these buttons, go to a use unit or a space in the *Use units* tree structure. Click on the **Multiple space editing** button to perform multiple operations.

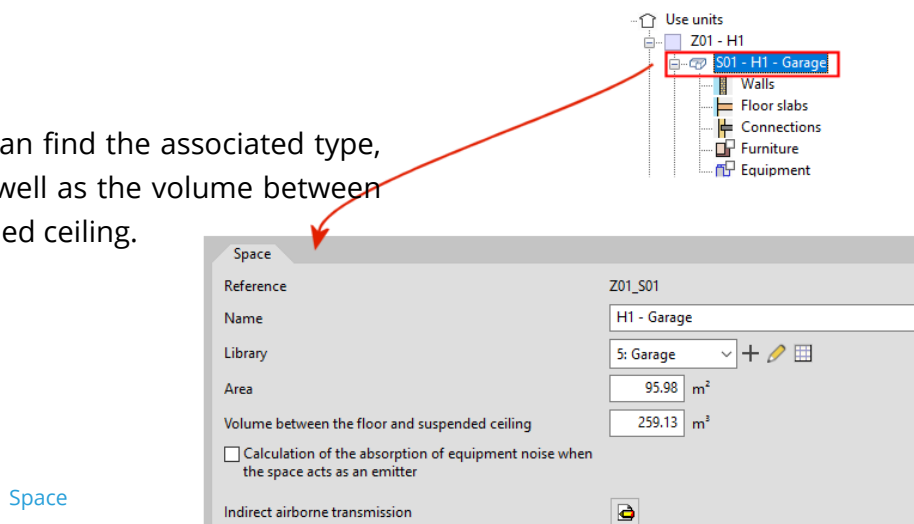
2.3.2 Use unit

Users must group together in a use unit the spaces belonging to the same area for acoustic analysis (all the rooms of an apartment in a multi-family dwelling).

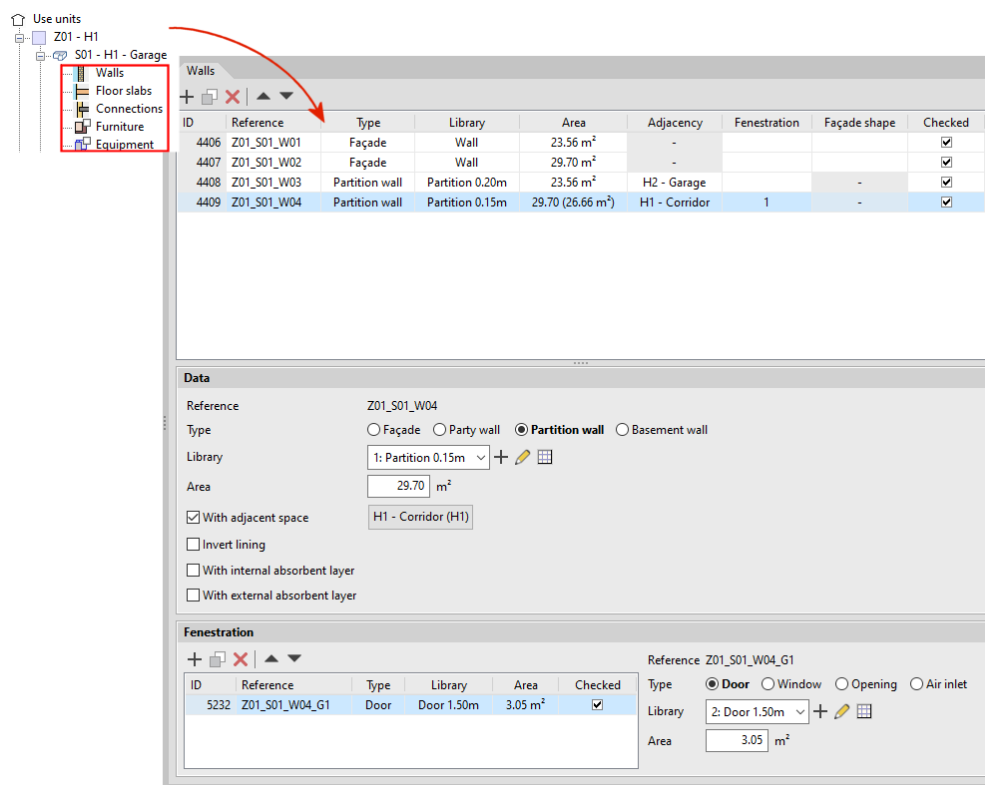


2.3.3 Space

At the space level users can find the associated type, the area of the space as well as the volume between the floor and the suspended ceiling.



2.3.4 Space elements



Space elements

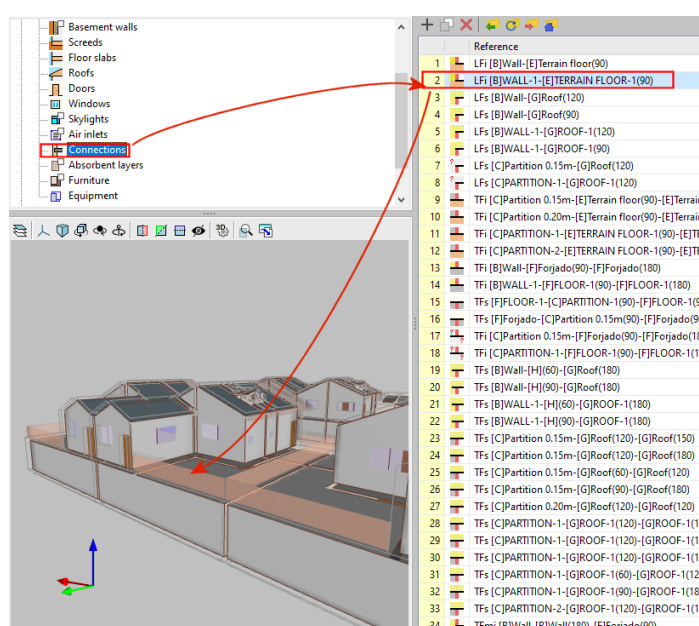
In each space users can view and manage the walls, roofs and floors of which the space is made, as well as the air inlets, absorbent layers, connections and the associated furniture.

2.4 BIM model

In the case of an analysis created from importing an IFC file, the elements being edited can be viewed on the BIM model in the view window.

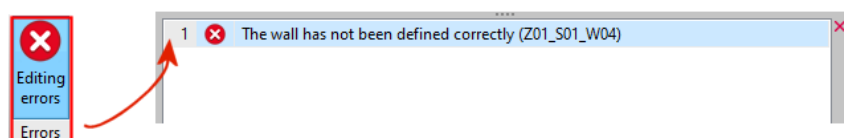
When selecting an element in the project's tree structure it is highlighted.

This topic is covered in more detail in the third part of this manual.



BIM model

2.5 Checking the model

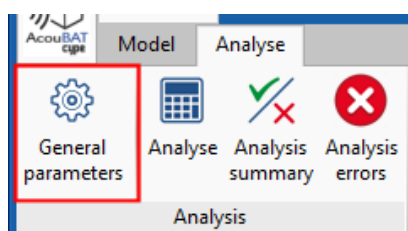


Checking the model

Before carrying out the analysis, users can check the consistency of data entry and detect errors with the help of the *Editing errors* tool.

2.6 Analysis

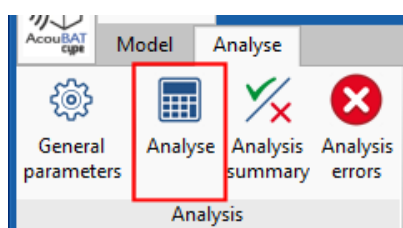
2.6.1 General parameters



General parameters

In the *Analysis* section of the *Analyse* tab the **General parameters** button can be found, which gives access to the parameters entered at the beginning of this manual.

2.6.2 Analyse



Analyse

The **Analyse** button allows users to carry out the acoustic analysis of their project. It is possible to analyse the project when desired, once all of the data has been filled in.

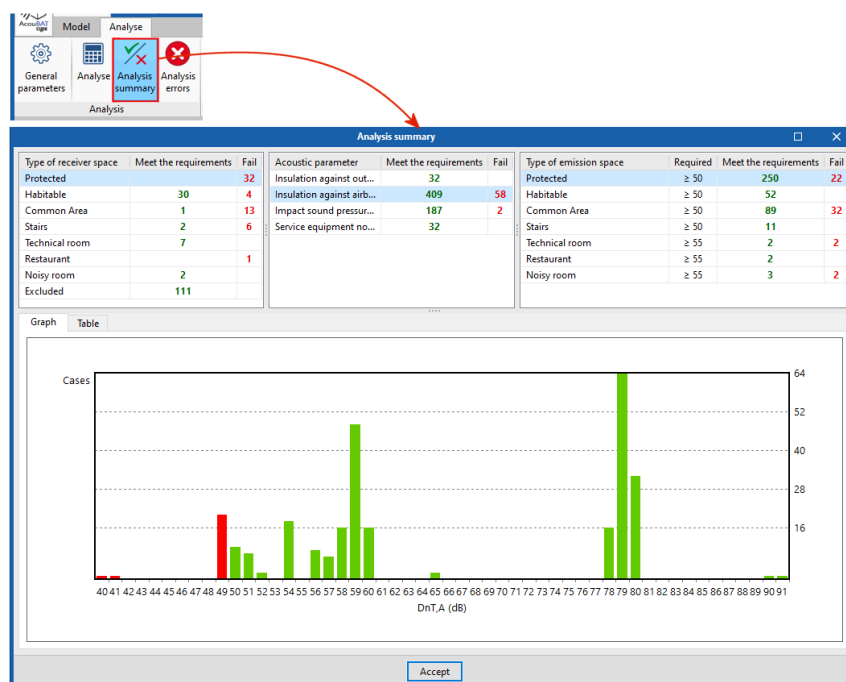
3 Results

3.1 Summary

After the analysis or by clicking on **Analysis summary**, a summary of the results is displayed.

Users can see this summary at any time by clicking on **Analysis summary**.

This summary table contains details of the results of the indoor and outdoor airborne sound insulation impact sound insulation, reverberation times, minimum sound absorption areas and sound pressure level produced by the building equipment.

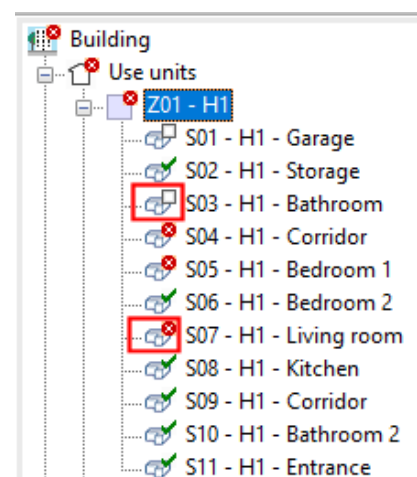


Analysis summary

3.2 Results

3.2.1 Compliance with requirements

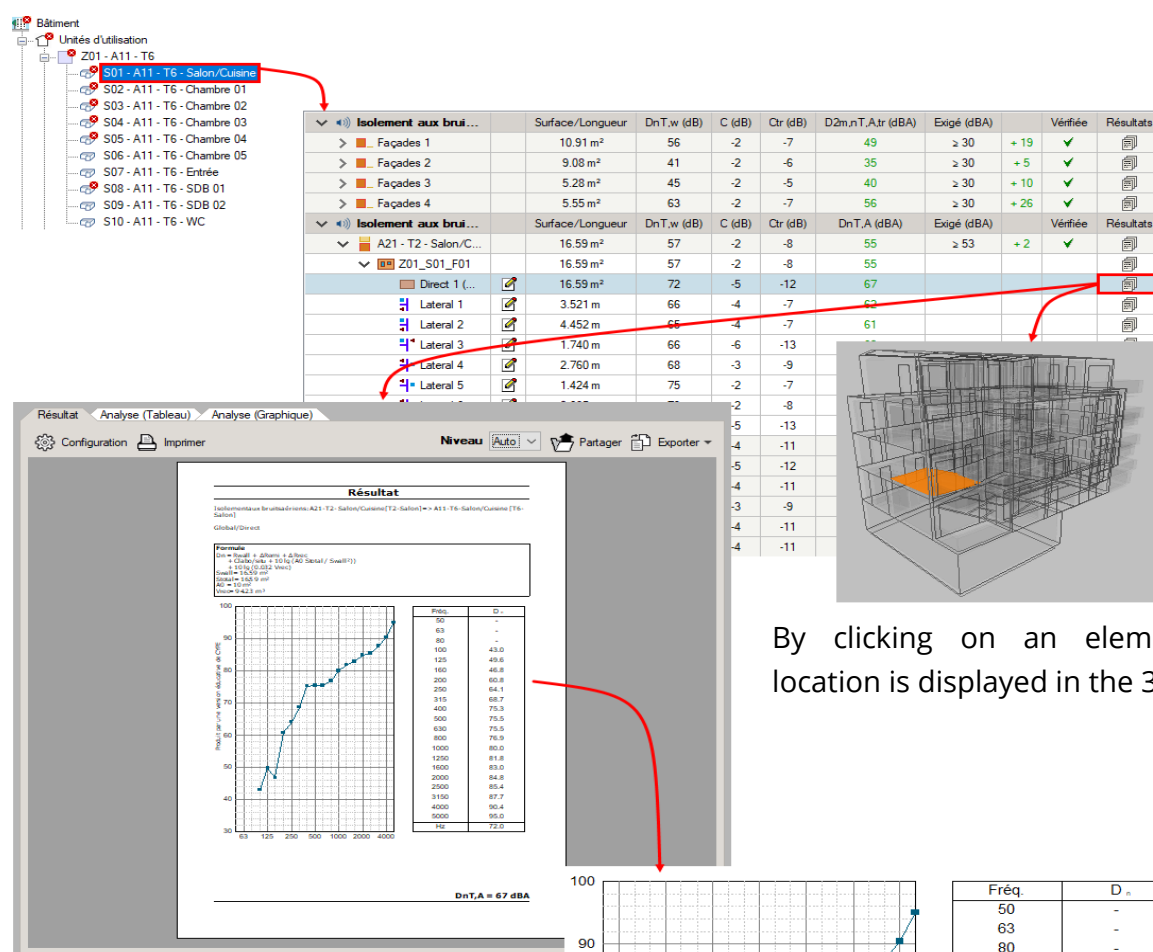
In the project tree structure, the spaces marked with a red cross have not met the acoustic requirements entered by the user. The other spaces comply with these requirements.



Compliance with requirements

3.2.2 Analysis details

By clicking on a space, the analysis details for each element of the space are displayed. Information on direct and lateral transmissions can also be found.



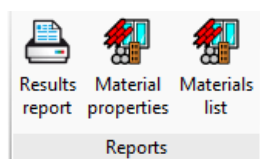
By clicking on an element, its location is displayed in the 3D view.

The report icon in the *Results* column allows users to view a detailed report of the analysis.

In these reports, users can access the calculated magnitudes (indoor and outdoor airborne sound insulation and impact sound insulation level). The results can be displayed in table or graph format using the tabs at the top of the window.

Analysis details

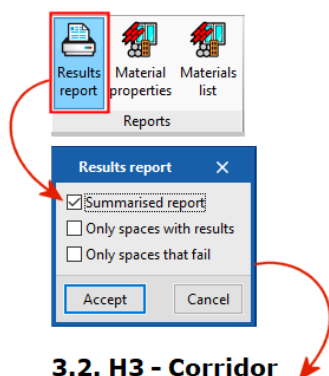
3.3 Reports



Reports

After having carried out the input, calculation and analysis of the project results, the different reports can be accessed in the *Reports* section of the *Analysis* tab.

3.3.1 Results report



3.2. H3 - Corridor

Type Habitable
Volume 62.57 m³

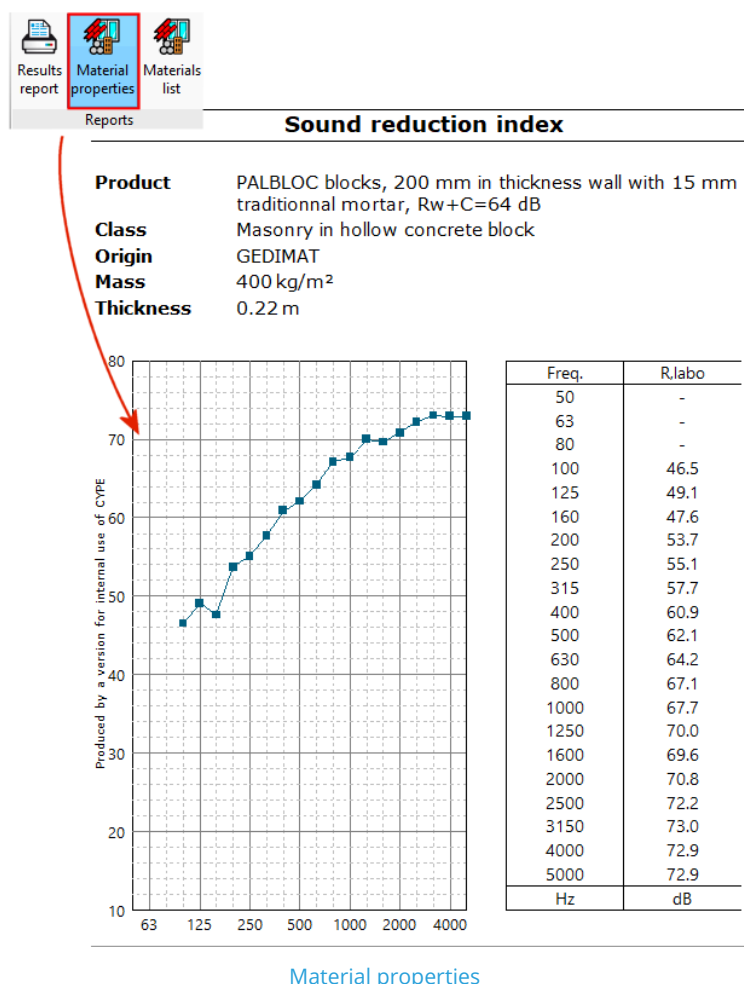
Insulation against airborne noise	Area/Length	DnT,w (dB)	C (dB)	Ctr (dB)	DnT,A (dB)	Required (dB)		Verified
H4 - Corridor	1.22 m²	60	-1	-4	59	≥ 45	+ 14	✓
H2 - Corridor	9.65 m²	57	-1	-4	56	≥ 45	+ 11	✓
H3 - Garage	29.84 m²	33	-1	-3	32	≥ 45	- 13	✗
H4 - Garage		63	-2	-5	61	≥ 45	+ 16	✓
H2 - Garage		63	-2	-5	61	≥ 45	+ 16	✓
Impact sound pressure level	Area/Length	L'nT,w (dB)			Required (dB)		Verified	
H3 - Garage		76			≤ 60		+ 16	✗

Results report

By clicking on *Results* report, users can generate different reports of the acoustic analysis according to the results they wish to display.

3.3.2 Material properties

By clicking on the **Material properties** button, a report with all the materials used in the project as well as their acoustic characteristics is generated.

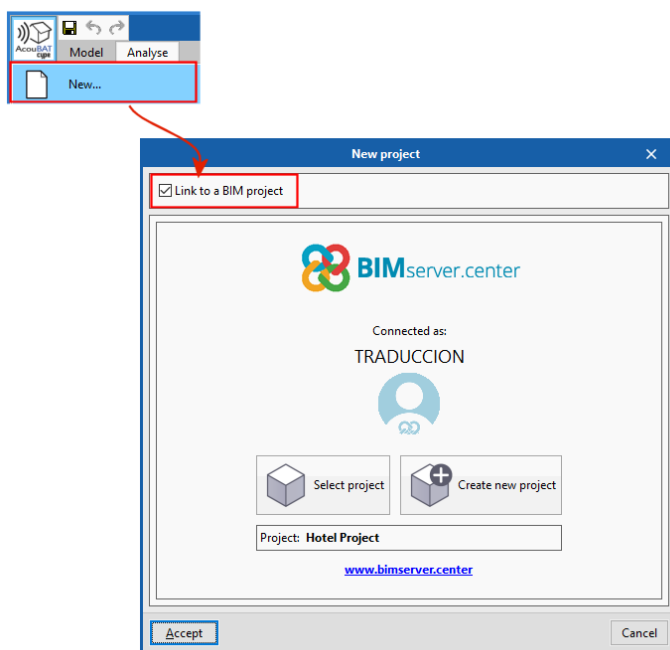


4 BIM interoperability

Definition: The IFC model is a digital model of the building in IFC format containing the base construction elements (walls, floor slabs, roofs, doors and windows, spaces and space edges), as well as the relationships between these elements, which we call *IFC Building Model*.

4.1 Importing a digital model

4.1.1 Creating a project



Creating a project

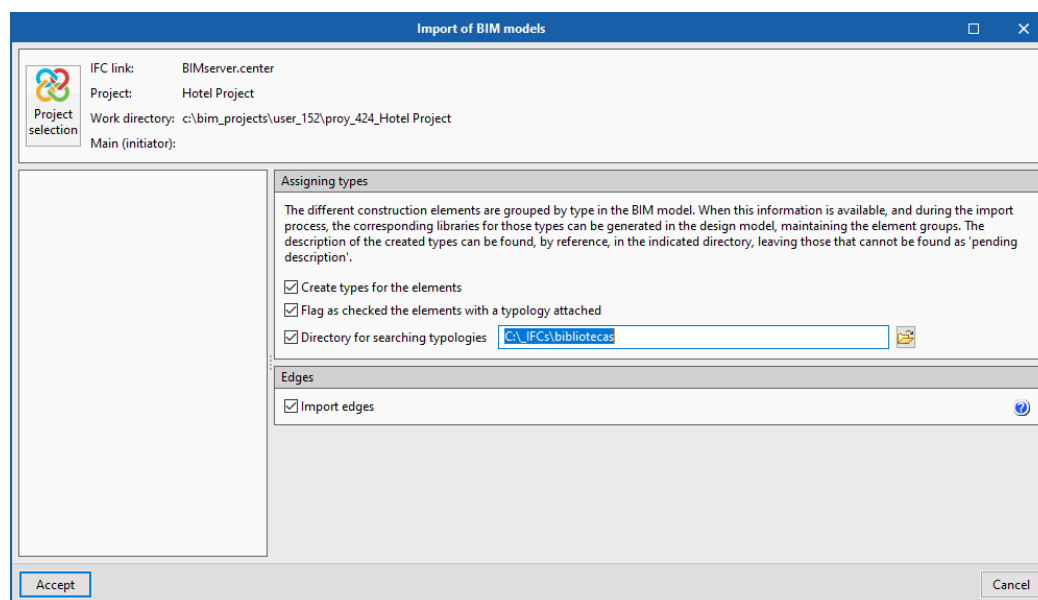
When creating a new project, users are asked whether or not they wish to connect it to a BIM project. It is recommended to connect it in order to be able carry out updates when there are modifications to the IFC model.

If users do not wish to connect it to a BIM project, they can import an IFC model without the possibility of updating it.

Note: in order to connect to a BIM project, users must first create an account on BIMserver.center and then connect it in AcouBAT by CYPE.

4.1.2 Import options

When connecting to a BIM project, select the project directly on BIMserver. Alternatively, without connecting to a BIM project, it can be imported from a local or network directory.



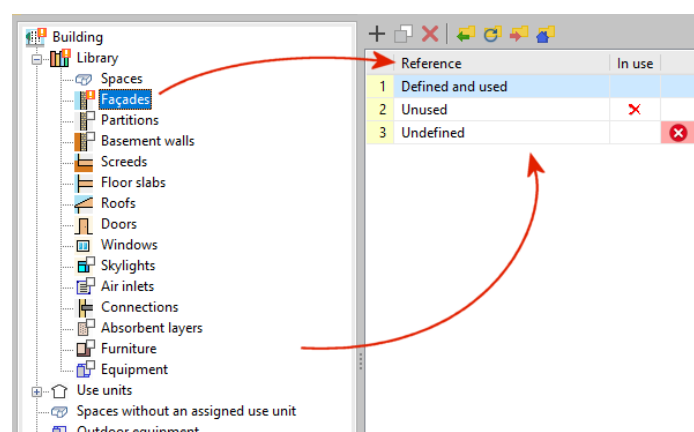
Import options

Then choose whether to assign types to the elements of the model. This option allows elements to be imported from an existing library.

By importing the IFC files exported from IFC Builder, users can import the edges of the buildings for the definition of acoustic transmissions.

4.2 Introduction of the model

Once the BIM model has been imported, its construction elements will be classified by type in the library. Users must then define them to remove the error message they display.

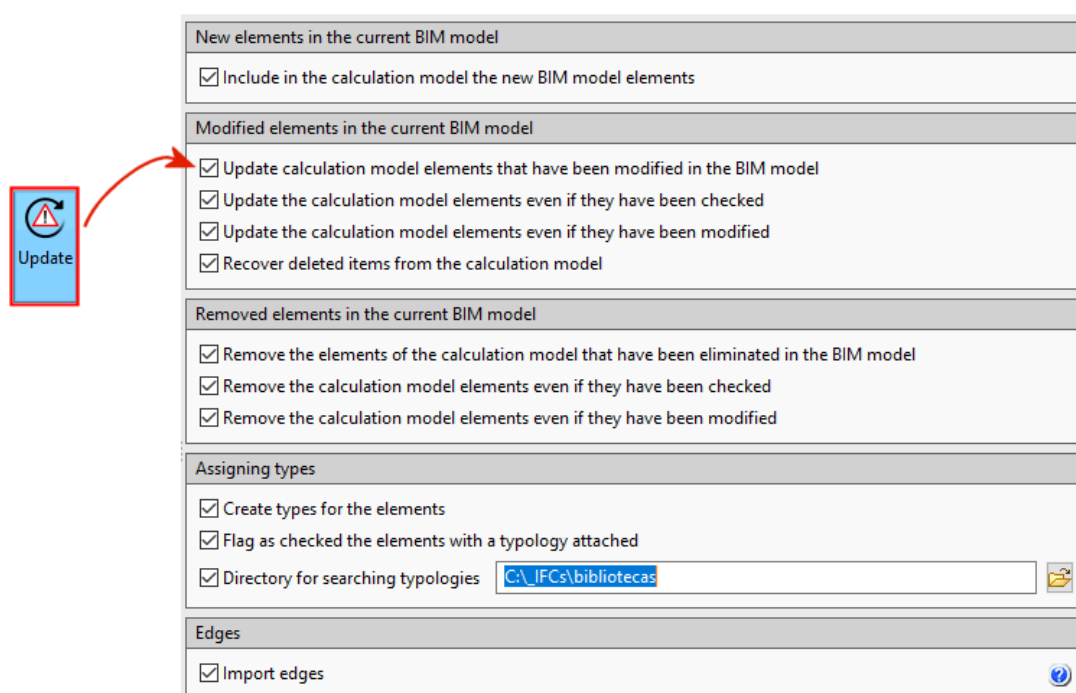


Introduction of the model

Folders whose elements still need to be defined are marked with exclamation marks. If they contain no elements they will be marked with small white squares.

Red crosses that appear in the *Used* column indicate that an element is not present or no longer present in the BIM model.

4.3 Updating the BIM model



Update

New elements in the current BIM model

- ☒ Include in the calculation model the new BIM model elements


Modified elements in the current BIM model

- ☒ Update calculation model elements that have been modified in the BIM model
- ☒ Update the calculation model elements even if they have been checked
- ☒ Update the calculation model elements even if they have been modified
- ☒ Recover deleted items from the calculation model


Removed elements in the current BIM model

- ☒ Remove the elements of the calculation model that have been eliminated in the BIM model
- ☒ Remove the calculation model elements even if they have been checked
- ☒ Remove the calculation model elements even if they have been modified

Assigning types

- ☒ Create types for the elements
- ☒ Flag as checked the elements with a typology attached
- ☒ Directory for searching typologies: 

Edges

- ☒ Import edges 

Updating the BIM model

If when importing the **Connect with a BIM model** option was chosen, each update of the IFC building model will be marked with a warning triangle on the **Update** button.

Click on this button to update the geometrical modifications made to the IFC model.

Users can then choose the elements to be modified or deleted. Do not import the edges if the definition of the thermal bridges needs to be kept as it is.